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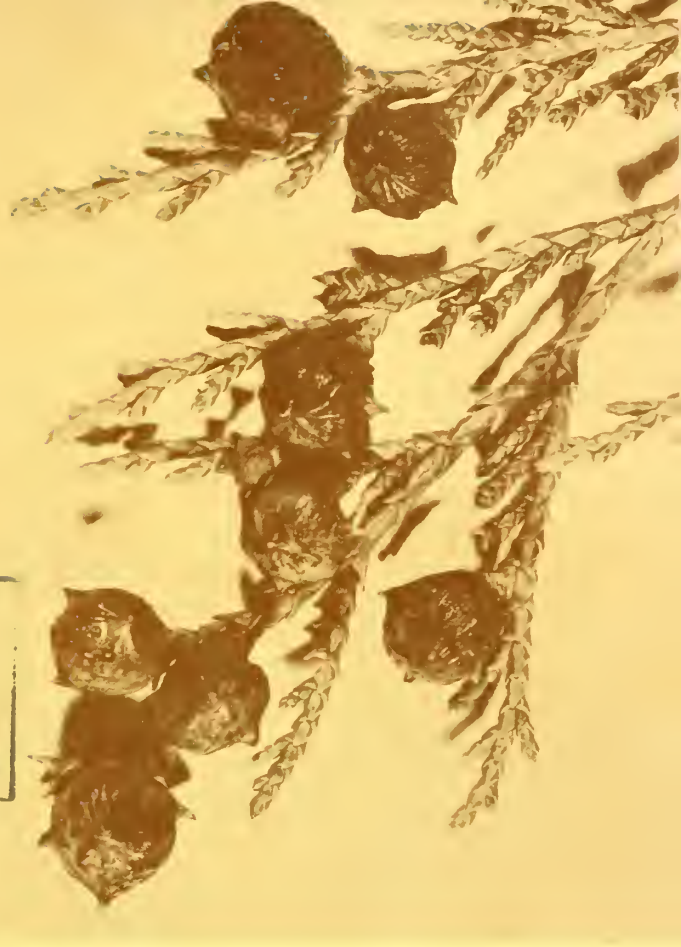

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Silvical Characteristics of Alaska-Cedar

(Chamaecyparis nootkatensis)

by Harold E. Andersen

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SILVICAL CHARACTERISTICS OF ALASKA-CEDAR

H. E. Andersen, Forester [1]

Alaska-cedar (Chamaecyparis nootkatensis (D. Don) Spach) is a conifer of the subfamily Cuppresseae, family Pinaceae. Other common names include Alaska cypress, Sitka cypress, yellow cypress, Alaska yellow-cedar, canoe cedar, Nootka cypress, Nootka Sound cypress, and Nootka false-cypress. Yellow-cedar is the common name approved by the Dominion Botanist in Canada. Recent Canadian trade designations are Pacific Coast cypress or Pacific Coast yellow-cedar (15). [2]

Alaska-cedar is a Pacific Coast species that reaches its best development in British Columbia and southern Alaska. Despite the many useful properties of Alaska-cedar, only small amounts are cut in Alaska because of the relative inaccessibility of the species. In British Columbia the cut of Alaska-cedar has increased severalfold in recent years (15) and the species is becoming one of the more valuable on the British Columbia coast.

Approximately one billion board feet of Alaska-cedar of sawtimber size occurs in Washington and a few million board feet in Oregon. [3] The inventory of Alaska-cedar in British Columbia was 1,560,123,000 cubic feet in 1955 (9), or over nine billion board feet. The net merchantable volume in Alaska is about 3,800 MM board feet based on estimates and incomplete surveys.

DISTRIBUTION

Alaska-cedar ranges from Oregon to Prince William Sound in Alaska (fig. 1). In Oregon it is found on the west side of the Cascades (20). There are three records of its occurrence in Jackson County at the California line. [4] An isolated stand has been reported in southeastern Oregon on the Malheur National Forest (1). In Washington it is frequent in the Olympic Mountains and on the west side of the Cascades (20). It is less abundant farther south in the Cascades but is known locally at several places on the east side. Alaska-cedar also occurs on the ridges of the Olympic Mountains and to lowlands at mouths of rivers on the Pacific Coast west of the Olympics (20).

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2/ Numbers in parentheses refer to literature cited, pages 9 and 10.

3/ Cowlin, R. W. Personal communication. U. S. Forest Service, Pacific Northwest Forest and Range Expt. Sta., 1956.

4/ Ibid.

Figure 1.--The botanical range of Alaska-cedar (Chamaecyparis nootkatensis (D. Don) Spach).

In British Columbia (6, 15) Alaska-cedar occurs in a narrow coastal belt on the mainland, coastal islands, and the Queen Charlotte Islands. An isolated stand has been reported at Hird and Evans Lakes near Slocan Lake in southern British Columbia about 450 miles inland.

Alaska-cedar is found in Southeast Alaska from tidewater to timberline, but it does not occur extensively at lower elevations south of Frederick Sound. Beyond the limits of western redcedar (Thuja plicata Donn) (3), Alaska-cedar is found in rather extensive, mainly mixed, stands from sea level to timberline. It is particularly common on Admiralty, Baranof, and Chichagof Islands. In the northern portion of Southeast Alaska, from Juneau to Icy Straits on the mainland to the northwestern limits of its range at Wells Bay in Prince William Sound (147° 30' W long., 61° 00' N lat.) Alaska-cedar occurs in discontinuous isolated groups. The distribution of these groups suggests that present day stands may be the remnants of more extensive stands which were destroyed in some of the more recent major glacial advances. Studies indicate there were several periods of major and minor glaciation in Alaska with intervening warmer periods (16). Unglaciated areas have been found along the coast of the Gulf of Alaska and in Prince William Sound (7), and it is probable that the isolated Alaska-cedar stands survived destruction by the ice in such areas.

HABITAT CONDITIONS

Climatic

Alaska-cedar is confined to a cool, humid climate (table 1). The growing season is relatively short but winter temperatures are not exceptionally severe. Although found under a wide range of growing conditions, the tree reacts quite sharply to different growing conditions (15). Trees on one aspect may be of good size, shape, and quality, but on another aspect nearby the trees may be small, twisted, and of poor quality. The minimum temperatures for various high elevation stations in Washington and Oregon and sea level stations in Alaska do not fall below about -20° F. Snowfall is heavy over much of its range. The narrow conical crown and flexible drooping leader and flat spray-like branches enable this species to resist snow damage and breakage. Munday (14) points out that it is the first of its associates to free itself of snow.

Edaphic

Little is known of the soil preferences of Alaska-cedar. It apparently can grow on extremely poor soils if there is an abundant supply of moisture. It is found on heavy, wet azonal organic sub-alpine soils, on muskegs with deep moss and peat layers, in half-bog soils, and on lithosols with thin organic layers. In Southeast Alaska it sometimes forms stands on rocky soils where previous Sitka spruce-western hemlock stands and organic layers have been destroyed by fire. In Alaska it reaches its best development near the upper limits of merchantable

Table 1.--Temperature, precipitation, and growing season at selected points within the range of Alaska-cedar 1/

Station	Temperature				Average annual precip.	Growing season
	January average	July average	Max.	Min.		
	°F	°F	°F	°F	Inches	Days
Government Camp (Mt.Hood) Clackamas County, Ore.	30.3	56.0	96	-16	84.81	--
Paradise Inn (Mt.Rainier) Pierce County, Wash.	26.1	51.7	92	-20	99.35	79
Prince Rupert, Brit. Col.	35.0	56.0	88	- 6	95.16	--
Petersburg, Alaska	28.5	55.6	81	- 5	106.45	129
Sitka, Alaska	32.4	54.9	87	- 5	87.13	159
Cordova, Alaska	27.2	54.8	87	-19	145.43	149

1/ From reference (12), except Prince Rupert data which are taken from reference (21).

timber on thin organic soils over bedrock where there is abundant groundwater seeping down from higher elevations. It seldom grows on the deeper well-drained soils of the lower slopes and valley bottoms. Yet, in Alaska at least, this species, when transplanted as an ornamental, makes good growth on deep well-drained soils. It apparently cannot compete with its more aggressive associates, Sitka spruce (Picea sitchensis (Bong.) Carr.) and western hemlock (Tsuga heterophylla (Raf.) Sarg.) except on the poorer or colder and wetter sites.

Physiographic

In the southern portion of its range Alaska-cedar grows on the cooler moist slopes between the elevations of 2,500 and 6,100 feet (20). Its altitudinal range in Washington varies from 2,000 to 7,500 feet in the Olympic and Cascade Mountains and to the lowlands west of the Olympics. In southern British Columbia the tree becomes general with respect to aspect but is seldom found below 2,000 feet. Northward the range decreases until its lower limit reaches tidewater at Knight Inlet (about 51° N. latitude) (15). From this vicinity northward, Alaska-cedar occurs at all elevations to the limit of tree growth. South of Frederick Sound in Southeast Alaska it does not occur extensively at lower elevations. But north of this area it is common from sea level to timberline.

Biotic

Alaska-cedar may be a component of the following western forest types as given by the Society of American Foresters (19): mountain hemlock-sub-alpine fir (Type No. 205); Sitka spruce-western hemlock (Type No. 225); western hemlock (Type No. 224); Pacific silver fir-hemlock (Type No. 226); western redcedar-western hemlock (Type No. 227); and western redcedar (Type No. 228). Alaska-cedar occurs mainly in mixture with other species, although it sometimes occurs in pure stands of limited extent (8, 15).

The lesser vegetation associated with this species varies with geographical location and other conditions. More common shrubs and herbaceous plants associated with Alaska-cedar, but common also to most other species in Alaska, are huckleberry (Vaccinium spp.), bunchberry (Cornus canadensis L.), rusty menziesia (Menziesia ferruginea Smith), American white Hellebore (Veratrum escholtizii A. Gray), and twisted stalk (Streptopus amplexifolius (L.) DC and S. roseus Michx.).

In Alaska the Alaska-cedar forms an important part of the diet of the Sitka black-tailed deer. At certain seasons and in certain localities the deer may feed on it almost exclusively. Preliminary studies by the Fish and Wildlife Service biologists have shown that Alaska-cedar is relatively high in protein (13). Because of its small size, it is not believed that seed-eating rodents feed on the seed to any great extent.

LIFE HISTORY

Seeding Habits

The inconspicuous monoecious flowers occur on the tips of different branches. Flowering may occur from April in the southern portion of its range to late May in the northern portion. It is generally recognized that the cones of Alaska-cedar mature in two years. It is possible that in the southern portion of its range there are races or individuals that mature cones in one year. Both the first and second-year cones may be found on a tree. The first-year cones are approximately 1/8-inch in diameter and green in color, while the maturing cones are purplish or purplish-brown in color and 1/4 to 1/2-inch in diameter. The seeds ripen, in Alaska, in late September and are dispersed during dryer periods in the fall and early winter. Cones may remain on the tree for several years.

No information is available on the distance Alaska-cedar seed is disseminated by the wind. James and Hayes (10) found a marked reduction in Port-Orford-cedar reproduction beyond 4 to 6 chains from an average seed source and concluded that seed dissemination of Port-Orford-cedar beyond this distance is limited. Because the seed of Alaska-cedar is heavier than that of Port-Orford-cedar (22) it is probable that its distance of dissemination is less.

Based on limited observations in Alaska, it is believed that some seed is produced nearly every year with moderate to good crops every two to four years. The germinative capacity seems to be quite low; the potential germination being 22 to 57 percent (22). Germination and growth of seedlings is best on mineral soils, damp moss, and muck (20).

Vegetative Reproduction

Alaska-cedar is known to reproduce vegetatively but it is not common and details are lacking. Adventitious rooting was noted on this species on Vancouver Island (18). New stems may originate where roots become exposed and secondary trunks may develop around the base of damaged trees (1, 15).

Seedling to Maturity

Alaska-cedar is one of the slower-growing and longer-lived western conifers. Munday (14) states that one hollow veteran 18 feet in circumference showed 1,040 growth rings in the 1-foot thick outer shell. He estimates that individuals of this species may reach 3,500 years of age. The largest known living specimen is a tree of 21-foot circumference and a height of 175 feet in the Olympic National Park, Washington (2). The largest trees (fig. 2) and the most extensive commercial stands of Alaska-cedar in British Columbia occur in the Nimpkish Valley 5/. A thrifty Alaska-cedar growing in a mixed stand with western hemlock on the South Tongass National Forest, Alaska, is shown in fig. 3.

Baker (5) classes Alaska-cedar as tolerant but indicates that this classification is uncertain. Sudworth (20) states that it is less tolerant than western redcedar and hemlock, but more tolerant than western white pine and noble fir. In Alaska, numerous observations in mixed or nearly pure stands of Alaska-cedar have failed to reveal seedlings or saplings of this species although western hemlock reproduction was abundant. Observations also show that the younger stands of Alaska-cedar are essentially even-aged. This tends to confirm Sudworth's observation that Alaska-cedar is less tolerant than western hemlock. There is considerable evidence that Alaska-cedar is intolerant in the northern part of its range. Its slower growth rate apparently enables it to compete with Sitka spruce, western hemlock, and western redcedar only on sites less favorable for these species. Its tolerance varies with soil moisture, climatic conditions, and age.

Alaska-cedar, in common with other "cedar-like" trees, is relatively free from insect enemies. There are no known cases of attacks by defoliating insects. Bark beetles of the genus *Phloeosinus* and the bark-boring roundheaded beetles of the genus *Atimia* are commonly found working under the bark of dead, dying, or weakened trees and occasionally in healthy trees (11).

5/ Schmidt, R. L. Personal communication. British Columbia Forest Service, 1958.

Figure 2.--A 90-inch diameter Alaska-cedar in the Nimpkish Valley, British Columbia. (Photo courtesy of British Columbia Forest Service.)

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Figure 3.--Thrifty Alaska-cedar in a mixed stand with western hemlock, South Tongass National Forest, Alaska.

Alaska-cedar seems to be especially susceptible to winter drying in Alaska. In 1956, extensive damage with some mortality was apparently caused by unfavorable moisture relations that occurred during a bright warm period in the spring while the soil was still frozen. The damage was confined largely to muskeg and scrub stands. The large number of spike-topped Alaska-cedars found in similar conditions may also be the result of unfavorable moisture relations on such sites.

Little is known of the fungal diseases of Alaska-cedar. Rhizomorpha of Armillaria mellea (Vahl.) Quel. have been collected between the bark and wood of dead and dying Alaska-cedar in Southeast Alaska. These collections were made in the muskeg and scrub types and it is believed the trees may have been weakened by unfavorable moisture conditions described above.

Catfaces and dead sides are commonly found in trees of this species in Alaska; but the cause has not been determined. The bark is thin and offers little protection against mechanical injury, fire, or sun scald. Heart-rotting fungi cause considerable loss and defect but little published information is available. In service, the wood is extremely durable and rot-resistant.

Varieties

Fifteen varieties of Alaska-cedar have been recognized (22). It is probable that a great number of races and varieties occur. Several horticultural varieties, Chamaecyparis nootkatensis glauca Beiss., C. n. lutea Beiss., C. n. compacta Beiss, and C. n. pendula (Beiss), Schneid. are described by Rehder (17) and Bailey (4). Rehder also shows the hybrid, X Cupressocyparis M. L. Green, between Cupressus and Chamaecyparis. The only known cross is Cupressocyparis heylandii (A. B. Jacks.) M. L. Green (Cuppressus macrocarpa Gord. X Chamaecyparis nootkatensis which is listed as Cuppressus heylandii by Bailey (4).

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